

CLAIMS:

1. A method of manufacturing a wire comprising:

filling a hole in a metal tube with magnesium;

sealing the ends of the tube;

deforming the tube to increase its length; and

contacting the tube with boron to react the magnesium with the boron to form superconducting magnesium diboride.
2. The method of Claim 1, wherein the magnesium is in the form of magnesium rods, pellets, powder, particles, flakes, or a combination thereof, and wherein the metal tube comprises copper, copper alloys, stainless steel, tantalum, magnesium, or nickel alloys.
3. The method of Claim 1, wherein the ratio of a radius of the hole to the radius of the tube is about 0.1 to about 0.99, prior to the deforming.
4. The method of Claim 1, wherein the metallic tube does not react with boron, and wherein the metallic tube permits the diffusion of boron.
5. The method of Claim 1, wherein the metallic tube further comprises additional non-intersecting holes that extend from a first end of the tube through to the second end of the tube and wherein at least one of these holes is filled with the magnesium prior to the deforming process.
6. The method of Claim 1, wherein the deforming is by extrusion, forging, rolling, swaging, drawing or a combination comprising at least one of the foregoing processes.
7. The method of Claim 6, wherein the deforming results in an increase of a unit length of the metal tube in an amount of greater than or equal to about 10% after the deforming.

8. The method of Claim 1, wherein the boron is in the form of a vapor or a liquid.

9. The method of Claim 1, further comprising heat treating the wire at a temperature of greater than or equal to about 600°C for a time period of greater than or equal to about 1 hour.

10. A method for making a superconducting wire comprising:

contacting a boron filament, tape or a combination of a filament and a tape with molten magnesium to form a magnesium diboride wire.

11. The method of Claim 10, wherein the boron filament has a characteristic dimension of about 1 to about 1,000 micrometers.

12. The method of Claim 10, wherein the boron substrate is contacted with the molten magnesium at a temperature of about 650 to about 1090°C.

13. The method of Claim 10, wherein the boron substrate is intermittently contacted with the molten magnesium.

14. The method of Claim 10, wherein the molten magnesium comprises dopants, and wherein the dopants are copper, gold, silver, magnesium, zinc, lead, cadmium, tin, bismuth, gallium, mercury, indium or combinations comprising at least one of the foregoing dopants.

15. The method of Claim 10, wherein the filament is a film.

16. The method of Claim 10, wherein the filament may be further deformed into a film or a tape.

17. A method for making a wire comprising:

contacting a first end of a first superconducting wire with a second end of a second superconducting wire, wherein the superconducting wire comprises a superconducting filament having a superconducting composition comprising magnesium diboride;

heating the first end of the first superconducting wire with the second end of the second superconducting wire at a point to form a joint, wherein the superconducting filament having the superconducting composition is in continuous electrical contact with any other part of the superconducting filament after the formation of the joint.

18. The method of Claim 17, wherein the heating is accomplished via electron beams, ultrasound, laser beams, plasma arc, electrical resistive heating, or a combination comprising at least one of the foregoing methods of heating.

19. The method of Claim 17, further comprising removing the metal matrix from the superconducting wire prior to the heating.

20. The method of Claim 17, wherein the heating is conducted to achieve temperatures of about 600 to about 1000°C.

21. The method of Claim 17, further comprising adding magnesium diboride or a combination of magnesium and boron to the point at which the first end of the first superconducting wire and the second end of the second superconducting wire are in a contact with one another.

22. The method of Claim 21, further comprising additionally heating the point to bring about a weld.

23. The method of Claim 22, further comprising heat treating the joint to improve the superconductivity.

24. The method of Claim 17, wherein the wire after heating has a total length of greater than or equal to about 350,000 feet.

25. An article derived from the method of Claim 1.
26. An article derived from the method of Claim 10.
27. An article derived from the method of Claim 17.
28. An electromagnetic device using an article derived from the method of Claim 1.
29. An electromagnetic device using an article derived from the method of Claim 10.
30. An electromagnetic device using an article derived from the method of Claim 17.